

# Ph.D. in Chemistry

## Ph.D. in Chemistry

### Independent Learning

The grounding in scientific research methodology provided by the dissertation requirement is a central focus of the PhD program. One of the primary means of education and training in the PhD program is achieved through successful completion of an original research project in close mentorship by their research adviser and the presentation and defense of the PhD dissertation. This intense research experience provides the education and training necessary for the student to substantiate his/her expertise and develop the skills necessary to become an independent professional. By the end of the second semester, students will choose a dissertation adviser. Students will conduct research either on site at NJIT or at the professional laboratories where they work. In either case, a member of the NJIT Department of Chemistry and Environmental Science faculty will serve as research adviser and approve the research topic. This research culminates in the writing and presentation of the dissertation. The student will present his/her dissertation for examination by a committee consisting of a minimum of five members including the research adviser. One of the committee members will be from outside the department. A majority of the program committee members will hold tenure-earning faculty appointments in the Department of Chemistry and Environmental Science. The committee has to be approved by the director of the PhD chemistry graduate program, the department chair and the Office of Graduate Studies. With the exception of the outside member, the other committee members need to have graduate faculty status. The dissertation must be judged worthy of publication by the dissertation committee and may not be submitted for examination until so deemed. For students performing their dissertation research off campus, the dissertation adviser will visit the student's laboratory, where their research is to be performed, before the research begins and on a regular basis until the work is complete.

Total Minimum Hours Required for PhD for students entering with Bachelor's Degree (without MS degree) - 36 Credit Hours of 600/700-level Courses

Total Minimum Hours Required for PhD for students entering with MS degree - 12 Credit Hours of 700-level Courses

## I. For Students Entering Without a MS Degree

### Required Courses

12

Take four of the following five core courses:

CHEM 605	Advanced Organic Chemistry I: Structure
CHEM 610	Advanced Inorganic Chemistry
CHEM 658	Advanced Physical Chemistry
CHEM 661	Instrumental Analysis Laboratory
CHEM 673	Biochemistry

If a student successfully completes all five core courses, one course will count towards fulfilling the electives requirement. Students must maintain a 3.0 GPA or higher.

### Elective Courses

24

Students are required to take a minimum of eight 600- or 700-level courses (24 credit hours) with at least four (12 credit hours) of these at the 700-level. Courses are to be chosen from the departmental offerings while up to six credit hours may be selected from outside of the department. Up to six credit hours of Independent Study courses may be earned in fulfillment of the elective courses requirement.

CHEM 714	Pharmaceutical Analysis
CHEM 716	Integrated Drug Dev & Discover
CHEM 719	Drug Delivery Systems
CHEM 725	Independent Study I
CHEM 726	Independent Study II
CHEM 737	Applications of Computational Chemistry and Molecular Modeling
CHEM 748	Nanomaterials
CHEM 764	Advanced Analytical Chemistry
CHEM 777	Principles Pharm Chemistry
CHE 681	Polymerization-Principles and Practice
CHE 724	Sustainable Energy
EVSC 622	Bioremediation
EVSC 712	Hazardous Substance Management
EVSC 715	Energy and Sustainability
BIOL 645	Biological Imaging Techniques
BME 651	Principles of Tissue Engineering
BME 653	Micro/Nanotechnologies for Interfacing Live Cells

BME 668	Medical Imaging Systems
BME 672	Biomaterials
BME 772	Adv Biomats for Lab and Clinic
MTSE 719	Physical Principles of Characterization of Solids
MTSE 722	Science and Technology of Thin Films
MTSE 724	Transport of Electrons and Phonons in Solids
MTSE 725	Crystallography and Diffraction
MTSE 780	Current Topics in Materials Science and Engineering

**Total Credits****36**

## Dissertation Research Credits

CHEM 792 Pre-Doctoral Research (after completing qualifying exam requirements)

CHEM 790 Doctoral Dissertation (after completing research proposal requirements)

## Qualifying Examination

By the end of the second year, students must pass the PhD qualifying oral examination. A student is given two chances to clear the exam. The qualifying examination consists of writing and orally defending an original research proposal to the student's dissertation committee in which the committee conducts an oral exam of the candidate (majority vote of the committee required). The original research proposal will focus on a topic not directly related to the student's dissertation research and must be approved by the dissertation committee prior to development of the proposal. Failure to pass the PhD qualifying exam will result in dismissal from the program.

## Dissertation Research Proposal

By the end of the first year of passing the qualifying exam, students must successfully present a proposal of their dissertation research to their dissertation committee and gain approval by a majority vote of the committee.

## Dissertation Defense

The final requirement for the PhD degree is completion of a satisfactory written dissertation of the student's research, along with successful presentation and defense of the dissertation to the student's dissertation committee (majority vote of the committee).

## II. For Students Entering With a MS Degree

Students with a recognized MS degree in the chemical sciences or closely related field may, with approval of the PhD Chemistry Graduate Committee, be admitted to pursue the PhD degree in chemistry and be required to earn a minimum of 12 credit hours of coursework at the 700-level. In cases where a student with a previous MS degree is not approved to pursue this (accelerated) program, they will follow the program outlined in I above and be eligible to transfer up to nine credit hours from previous graduate courses, similar to students that have prior graduate course credits but no MS degree.

## Elective Courses

**12**

Students are required to take a minimum of four 700-level courses (12 credit hours). Courses are to be chosen from the departmental offerings while up to three credit hours may be selected from outside of the department.

CHEM 714	Pharmaceutical Analysis
CHEM 716	Integrated Drug Dev & Discover
CHEM 719	Drug Delivery Systems
CHEM 725	Independent Study I
CHEM 726	Independent Study II
CHEM 737	Applications of Computational Chemistry and Molecular Modeling
CHEM 748	Nanomaterials
CHEM 764	Advanced Analytical Chemistry
CHEM 777	Principles Pharm Chemistry
CHE 724	Sustainable Energy
EVSC 712	Hazardous Substance Management
EVSC 715	Energy and Sustainability
BME 772	Adv Biomats for Lab and Clinic
MTSE 719	Physical Principles of Characterization of Solids
MTSE 722	Science and Technology of Thin Films
MTSE 724	Transport of Electrons and Phonons in Solids
MTSE 725	Crystallography and Diffraction

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**Total Credits****12****Dissertation Research Credits**

CHEM 792 Pre-Doctoral Research (after completing qualifying exam requirements)

CHEM 790 Doctoral Dissertation (after completing research proposal requirements)

**Qualifying Examination**

By the end of the third semester, students must pass the PhD qualifying oral examination. A student is given two chances to clear the exam. The qualifying examination consists of writing and orally defending an original research proposal to the student's dissertation committee in which the committee conducts an oral exam of the candidate (majority vote of the committee). The original research proposal will focus on a topic not directly related to the student's dissertation research and must be approved by the adviser and advisory committee prior to development of the proposal. Failure to pass the PhD proficiency exam will result in dismissal from the program.

**Dissertation Research Proposal**

Within a year of passing the qualifying exam, students must successfully present a proposal of their dissertation research to their dissertation committee and gain approval by a majority vote of the committee.

**Dissertation Defense**

The final requirement for the PhD degree is completion of a satisfactory written dissertation of the student's research, along with successful presentation and defense of the dissertation to the student's dissertation committee (majority vote of the committee).

**Grades**

All students must maintain a grade point average of at least 3.0.